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Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

PTOL-90A (Rev. 04/07)

	Application No.	Applicant(s)
Office Action Summary	10/589,898	NAKASAKA, YUKIHIRO
	Examiner	Art Unit
	SIZO B. VILAKAZI	3747

-- *The MAILING DATE of this communication appears on the cover sheet with the correspondence address* --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE *3* MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *10 December 2008*.

2a)☒ This action is **FINAL**.   2b)☐ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *1-14 and 16-19* is/are pending in the application.

　　4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *1-14 and 16-19* is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☐ The drawing(s) filed on _____ is/are: a)☐ accepted or b)☐ objected to by the Examiner.

　　Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

　　Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

　　a)☒ All   b)☐ Some * c)☐ None of:

　　　1.☒ Certified copies of the priority documents have been received.

　　　2.☐ Certified copies of the priority documents have been received in Application No. _____.

　　　3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

　* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☐ Information Disclosure Statement(s) (PTO/SB/08) Paper No(s)/Mail Date _____.

4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____ .
5) ☐ Notice of Informal Patent Application
6) ☐ Other: _____.

DETAILED ACTION

The Amendments and Applicant arguments submitted on 12/10/2008 have been

received and its contents have been carefully considered.

Claim 15 is cancelled.

Claims 1-14 and 16-19 are presented for examination.

Claim Rejections - 35 USC § 103

1.   The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all

obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set
> forth in section 102 of this title, if the differences between the subject matter sought to be patented and
> the prior art are such that the subject matter as a whole would have been obvious at the time the
> invention was made to a person having ordinary skill in the art to which said subject matter pertains.
> Patentability shall not be negatived by the manner in which the invention was made.

2.   Claims 1-3, 5-7, 9-11, 13, and 16-19 are rejected under 35 U.S.C. 103(a) as

being unpatentable over Shomura (US Patent No. 6,170,465 B1) in view of Ishikawa et

al. (US Patent No. 6,975,934 B2), Mashiki (US Patent No. 6,176,220 B1), **and**

Sugiyama et al. (US Patent 6,792,901 B2).

3.   In Re claims 1-3, Shomura discloses

       a.   An injection amount control means for changing a fuel injection amount

       from an injection amount for stoichiometric operation to either an increased

amount or a decreased amount (Fig. 1, item 23, Column 7, Lines 36-43, and

Lines 54-62)

b.   A computation means for determining the amount of a torque or rotation

speed change that occurs when the fuel injection amount is changed by the

injection amount control means (Fig. 1, item 39, Column 7, Lines 54-62 and

Column 8, Lines 10-14)

c.   that the various detected values detected by the various sensors, or the

values stored in the control unit could be output to the vehicle's tachometer or

other such device (Column 14, Lines 38-67)

d.   that the rotation speed change is stored in the control unit (Column 10,

Lines 17-22), therefore it is a value capable of being output

4.   With regards to the "injection amount control means for changing a fuel injection

amount from an injection amount for stoichiometric operation to either an increased

amount or a decreased amount" within claim 1, this limitation meets the three prong test

per MPEP 2181 and thereby invokes 35 USC 112 6th paragraph. The "injection amount

control means for changing a fuel injection amount from an injection amount for

stoichiometric operation to either an increased amount or a decreased amount" is

explained on Page 29, Lines 3-14 and Fig. 1, item 18 in the specification. Shomura

teaches a means for changing the fuel injection amount (Column 7, Lines 36-43, and

Lines 54-62). The method taught by Shomura is considered to be equivalent because it

performs the same function in substantially the same way and produces substantially

the same result as the corresponding element in the applicant's specification.

5.   With regards to the "computation means for determining the amount of a torque
or rotation speed change that occurs when the fuel injection amount is changed by the
injection amount control means" within claim 1, this limitation meets the three prong test
per MPEP 2181 and thereby invokes 35 USC 112 6th paragraph. The "computation
means for determining the amount of a torque or rotation speed change that occurs
when the fuel injection amount is changed by the injection amount control means" is
explained on Page 29, Lines 15-21 in the specification. Shomura teaches a means for
determining the rotation speed change that occurs when the fuel injection amount is
changed (Column 7, Lines 54-62 and Column 8, Lines 10-14). The method taught by
Shomura is considered to be equivalent because it performs the same function in
substantially the same way and produces substantially the same result as the
corresponding element in the applicant's specification.

6.   With regards to the "output means for outputting the torque or rotation speed
change amount determined by the computation means as an index value that indicates
the degree of intake air amount variation among the cylinders" within claim 1, this
limitation meets the three prong test per MPEP 2181 and thereby invokes 35 USC 112
6th paragraph. The "output means for outputting the torque or rotation speed change
amount determined by the computation means as an index value that indicates the
degree of intake air amount variation among the cylinders" is explained on Page 30,
Lines 9-26 in the specification.

7.   Shomura does not disclose output means for outputting the torque or rotation

speed change amount determined by the computation means *as an index value that*

indicates the degree of intake air amount variation among the cylinders

8.   However, Ishikawa et al. acknowledge that the variation in air intake amount can

be detected or corrected based on the engine torque or rotational speed variation

resulting from a change in fuel injection amount (Column 1, Line 64 through Column 2

Line 40)

9.   Shomura/Ishikawa et al. do not disclose the comparison and judgment means as

set forth in the claim.

10.   However, Mashiki discloses

        a.   comparison means for comparing a predetermined reference value with

        the amount of a change that occurs when the injection amount control means

        changes the fuel injection amount from the injection amount for stoichiometric

        operation (Column 10, Lines 58-63; and Column 14, Lines 5-26);

        b.   and judgment means, which, when comparing the change to the reference

        value, judges that a permissible level is exceeded by the air intake amount

        variations among the cylinders (Column 10, Line 65 through Column 11, Line

        17).

11.   The examiner notes that Mashiki compares the predetermined reference value

(dlnv – C1) to the amount of change that occurred (dln), and judges that a permissible

torque variation is exceeded as evidenced by the subsequent change in fuel injection

amount (Column 11, Lines 15-17). As has already been discussed, Ishikawa discloses

that it is common knowledge in the art that excess torque variation is linked to air intake variation, thus in judging that excess torque variation has been exceeded, Mashiki judges that a permissible level of intake air amount variation is exceeded.

12.   Therefore, it would have been obvious to one having ordinary skill in the art at the time the invention was made to modify the system of Shomura/Ishikawa with the system disclosed by Mashiki in order to make adjustments to the fuel injection amount only when an excessive amount of air amount variation among cylinders occurs.

13.   **As to the newly added limitation of the intake air amount variation detector comprising:** *Conversion means for converting the intake air amount variations among the cylinders to intake valve operating angle variations among the cylinders and/or intake valve lift amount variations among the cylinders.*

14.   **Sugiyama et al. disclose a control system with the claimed conversion means (Column 1, Lines 44-55)**

15.   **Therefore it would have been obvious to one having ordinary skill in the art at the time the invention was made to modify the system disclosed by Shomura/Ishikawa/Mashiki with the operating angle conversion means disclosed by Sugiyama et al in order to accurately adjust the intake air amounts in each cylinder of the engine.**

16.   In Re claims 5-7, Shomura discloses

   a.   An injection amount control means for changing a fuel injection amount for a particular one of the cylinders from an injection amount for stoichiometric

operation to either an increased amount or a decreased amount (Column 7,

Lines 36-43 and Lines 54-62, Column 10, Lines 61-67)

b.   A computation means for determining the amount of a torque or rotation

speed change that occurs when the fuel injection amount for the particular

cylinder is changed by the injection amount control means (Column 7, Lines 54-

62 and Column 8, Lines 10-14)

c.   that the various detected values detected by the various sensors, or the

values stored in the control unit could be output to the vehicle's tachometer or

other such device (Column 14, Lines 38-67)

d.   that the rotation speed change is stored in the control unit (Column 10,

Lines 17-22), therefore it is a value capable of being output

17.   With regards to the "An injection amount control means for changing a fuel

injection amount for a particular one of the cylinders from an injection amount for

stoichiometric operation to either an increased amount or a decreased amount" within

claim 1, this limitation meets the three prong test per MPEP 2181 and thereby invokes

35 USC 112 6th paragraph. The "injection amount control means for changing a fuel

injection amount from an injection amount for stoichiometric operation to either an

increased amount or a decreased amount" is explained on Page 35, Lines 3-18 and

Fig. 1, item 18 in the specification. Shomura teaches a means for changing the fuel

injection amount (Column 7, Lines 36-43, and Lines 54-62). The method taught by

Shomura is considered to be equivalent because it performs the same function in

substantially the same way and produces substantially the same result as the

corresponding element in the applicant's specification.

18.   With regards to the "computation means for determining the amount of a torque

or rotation speed change that occurs when the fuel injection amount for the particular

cylinder is changed by the injection amount control means" within claim 1, this limitation

meets the three prong test per MPEP 2181 and thereby invokes 35 USC 112 6th

paragraph. The "computation means for determining the amount of a torque or rotation

speed change that occurs when the fuel injection amount for the particular cylinder is

changed by the injection amount control means" is explained on Page 35, Lines 19-22

in the specification. Shomura teaches a means for determining the rotation speed

change that occurs when the fuel injection amount is changed (Column 7, Lines 54-62

and Column 8, Lines 10-14). The method taught by Shomura is considered to be

equivalent because it performs the same function in substantially the same way and

produces substantially the same result as the corresponding element in the applicant's

specification.

19.   With regards to the "output means for outputting the torque or rotation speed

change amount determined by the computation means as an index value that indicates

the degree of intake air amount variation in the particular cylinder" within claim 1, this

limitation meets the three prong test per MPEP 2181 and thereby invokes 35 USC 112

6th paragraph. The "output means for outputting the torque or rotation speed change

amount determined by the computation means as an index value that indicates the

degree of intake air amount variation in the particular cylinder" is explained on Page 36,

Lines 1-21 in the specification.

20.   Shomura does not disclose output means for outputting the torque or rotation

speed change amount determined by the computation means as an index value that

indicates the degree of intake air amount variation in the particular cylinder.

21.   However, Ishikawa et al. acknowledge that the variation in air intake amount can

be detected or corrected based on the engine torque or rotational speed variation

resulting from a change in fuel injection amount (Column 1, Line 64 through Column 2

Line 40).

22.   Therefore, it would have been obvious to one having ordinary skill in the art at

the time the invention was made to have modified system disclosed by Shomura with

the information disclosed by Ishikawa et al. to arrive at an output means for outputting

torque or rotation speed change amount determined by the computation means as an

index value that indicates the degree of intake air amount variation in the particular

cylinder, with the purpose in mind of adjusting the intake air in accordance with the

torque variation (Ishikawa, Col. 2, line 36-41).

23.   Furthermore, Shomura/Ishikawa et al. do not disclose the comparison and

judgment means as set forth in the claim.

24.   However, Mashiki discloses

       a.   comparison means for comparing a predetermined reference value with

             the amount of a change that occurs when the injection amount control means

changes the fuel injection amount from the injection amount for stoichiometric

operation (Column 10, Lines 58-63; and Column 14, Lines 5-26));

b.   and judgment means, which, when comparing the change to the reference

value, judges that a permissible level is exceeded by the air intake amount

variations among the cylinders (Column 10, Line 65 through Column 11, Line

17).

25.   The examiner notes that Mashiki compares the predetermined reference value

(dInv – C1) to the amount of change that occurred (dIn), and judges that a permissible

torque variation is exceeded as evidenced by the subsequent change in fuel injection

amount (Column 11, Lines 15-17). As has already been discussed, Ishikawa discloses

that it is common knowledge in the art that excess torque variation is linked to air intake

variation, thus in judging that excess torque variation has been exceeded, Mashiki

judges that a permissible level of intake air amount variation is exceeded.

26.   Therefore, it would have been obvious to one having ordinary skill in the art at

the time the invention was made to modify the system of Shomura/Ishikawa with the

system disclosed by Mashiki in order to make adjustments to the fuel injection amount

only when an excessive amount of air amount variation among cylinders occurs.

27.   **As to the newly added limitation of the intake air amount variation detector

comprising: *Conversion means for converting the intake air amount variations

among the cylinders to intake valve operating angle variations among the

cylinders and/or intake valve lift amount variations among the cylinders.***

28. **Sugiyama et al. disclose a control system with the claimed conversion means (Column 1, Lines 44-55)**

29. **Therefore it would have been obvious to one having ordinary skill in the art at the time the invention was made to modify the system disclosed by Shomura/Ishikawa/Mashiki with the operating angle conversion means disclosed by Sugiyama et al in order to accurately adjust the intake air amounts in each cylinder of the engine.**

28. In Re claims 9-11, Shomura discloses

a. An injection amount control means for changing a fuel injection amount from an injection amount for stoichiometric operation to either an increased amount or a decreased amount (Column 7, Lines 36-43 and Lines 54-62, Column 10, Lines 61-67)

b. A computation means for determining on an individual cylinder basis the amount of a torque or rotation speed change that occurs when the fuel injection amount is changed by the injection amount control means (Column 7, Lines 54-62 and Column 8, Lines 10-14)

c. that the various detected values detected by the various sensors, or the values stored in the control unit could be output to the vehicle's tachometer or other such device (Column 14, Lines 38-67)

d. that the rotation speed change is stored in the control unit (Column 10, Lines 17-22), therefore it is a value capable of being output

29.   With regards to the "injection amount control means for changing a fuel injection amount for a particular one of the cylinders from an injection amount for stoichiometric operation to either an increased amount or a decreased amount" within claim 1, this limitation meets the three prong test per MPEP 2181 and thereby invokes 35 USC 112 6th paragraph. The "injection amount control means for changing a fuel injection amount from an injection amount for stoichiometric operation to either an increased amount or a decreased amount" is explained on Page 41, Lines 5-7 and Fig. 1, item 18 in the specification. Shomura teaches a means for changing the fuel injection amount (Column 7, Lines 36-43, and Lines 54-62). The method taught by Shomura is considered to be equivalent because it performs the same function in substantially the same way and produces substantially the same result as the corresponding element in the applicant's specification.

30.   With regards to the "computation means for determining on an individual cylinder basis the amount of a torque or rotation speed change that occurs when the fuel injection amount is changed by the injection amount control means" within claim 1, this limitation meets the three prong test per MPEP 2181 and thereby invokes 35 USC 112 6th paragraph. The "computation means for determining on an individual cylinder basis the amount of a torque or rotation speed change that occurs when the fuel injection amount is changed by the injection amount control means" is explained on Page 41, Lines 11-14 in the specification. Shomura teaches a means for determining the rotation speed change that occurs when the fuel injection amount is changed (Column 7, Lines 54-62 and Column 8, Lines 10-14). The method taught by Shomura is considered to be

equivalent because it performs the same function in substantially the same way and produces substantially the same result as the corresponding element in the applicant's specification.

31.   With regards to the "output means for outputting the torque or rotation speed change amount determined by the computation means as an index value that indicates the degree of intake air amount variation in an individual cylinder" within claim 1, this limitation meets the three prong test per MPEP 2181 and thereby invokes 35 USC 112 6th paragraph. The "output means for outputting the torque or rotation speed change amount determined by the computation means as an index value that indicates the degree of intake air amount variation in an individual cylinder" is explained on Page 41, Lines 25 through Page 42, Line 22 in the specification.

32.   Shomura does not disclose output means for outputting the torque or rotation speed change amount determined by the computation means as an index value that indicates the degree of intake air amount variation in an individual cylinder.

33.   However, Ishikawa et al. acknowledge that the variation in air intake amount can be detected or corrected based on the engine torque or rotational speed variation resulting from a change in fuel injection amount (Column 1, Line 64 through Column 2 Line 24).

34.   Therefore, it would have been obvious to one having ordinary skill in the art at the time the invention was made to have modified system disclosed by Shomura with the information disclosed by Ishikawa et al. to arrive at an output means for outputting torque or rotation speed change amount determined by the computation means as an

index value that indicates the degree of intake air amount variation in an individual

cylinder, with the purpose in mind of adjusting the intake air in accordance with the

torque variation (Ishikawa, Col. 2, line 36-41).

35.   Furthermore, Shomura/Ishikawa et al. do not disclose the comparison and

judgment means as set forth in the claim.

36.   However, Mashiki discloses

        a.   comparison means for comparing a predetermined reference value with

        the amount of a change that occurs when the injection amount control means

        changes the fuel injection amount from the injection amount for stoichiometric

        operation (Column 10, Lines 58-63; and Column 14, Lines 5-26));

        b.   and judgment means, which, when comparing the change to the reference

        value, judges that a permissible level is exceeded by the air intake amount

        variations among the cylinders (Column 10, Line 65 through Column 11, Line

        17).

37.   The examiner notes that Mashiki compares the predetermined reference value

(dlnv – C1) to the amount of change that occurred (dln), and judges that a permissible

torque variation is exceeded as evidenced by the subsequent change in fuel injection

amount (Column 11, Lines 15-17). As has already been discussed, Ishikawa discloses

that it is common knowledge in the art that excess torque variation is linked to air intake

variation, thus in judging that excess torque variation has been exceeded, Mashiki

judges that a permissible level of intake air amount variation is exceeded.

38.   Therefore, it would have been obvious to one having ordinary skill in the art at the time the invention was made to modify the system of Shomura/Ishikawa with the system disclosed by Mashiki in order to make adjustments to the fuel injection amount only when an excessive amount of air amount variation among cylinders occurs.

39.   **As to the newly added limitation of the intake air amount variation detector comprising:** *Conversion means for converting the intake air amount variations among the cylinders to intake valve operating angle variations among the cylinders and/or intake valve lift amount variations among the cylinders.*

40.   **Sugiyama et al. disclose a control system with the claimed conversion means (Column 1, Lines 44-55)**

41.   **Therefore it would have been obvious to one having ordinary skill in the art at the time the invention was made to modify the system disclosed by Shomura/Ishikawa/Mashiki with the operating angle conversion means disclosed by Sugiyama et al in order to accurately adjust the intake air amounts in each cylinder of the engine.**

42.   In Re claim 13, Shomura discloses:

a.   first injection amount control means for changing the fuel injection amount for a particular one of the cylinders from an injection amount for stoichiometric operation to an increased amount (Fig. 1, item 23, Column 7, Lines 36-43, and Lines 54-62)

b.   output means for outputting the torque or rotation speed change amount determined by the first computation means and the torque or rotation speed

change amount determined by the second computation means as index values

that indicate the degree of intake air amount variation in the particular cylinder

(see claim 1 rejection above)

43.   Shomura does not disclose:

a.   first computation means for determining the amount of a torque or rotation

speed change that occurs when the fuel injection amount for the particular

cylinder is changed by the first injection amount control means

b.   second injection amount control means, which, when the torque or rotation

speed change amount determined by the first computation means is not greater

than a predetermined reference value, decreases the fuel injection amount for

the particular cylinder from the injection amount for stoichiometric operation

c.   second computation means for determining the amount of a torque or

rotation speed change that occurs when the fuel injection amount for the

particular cylinder is changed by the second injection amount control means (

44.   However, Mashiki discloses:

a.   first computation means for determining the amount of a torque or rotation

speed change that occurs when the fuel injection amount for the particular

cylinder is changed by the first injection amount control means (Column 9, Lines

54-58)

b.   second injection amount control means, which, when the torque or rotation

speed change amount determined by the first computation means is not greater

than a predetermined reference value, decreases the fuel injection amount for

the particular cylinder from the injection amount for stoichiometric operation

(Column 10, Line 58 through Column 11, Line 17)

c.   second computation means for determining the amount of a torque or

rotation speed change that occurs when the fuel injection amount for the

particular cylinder is changed by the second injection amount control means

(Column 9, Lines 22-29)

45.   With regards to the "first computation means for determining the amount of a

torque or rotation speed change that occurs when the fuel injection amount for the

particular cylinder is changed by the first injection amount control means" within claim 1,

this limitation meets the three prong test per MPEP 2181 and thereby invokes 35 USC

112 6th paragraph. The "first computation means for determining the amount of a torque

or rotation speed change that occurs when the fuel injection amount for the particular

cylinder is changed by the first injection amount control means" is explained on Page

55, Line 26 through Page 56, Line 1in the specification. Mashiki teaches a means for

determining the amount of a torque or rotation speed change that occurs when the fuel

injection amount for the particular cylinder is changed by the first injection amount

control means (Column 9, Lines 54-58). The method taught by Mashiki is considered to

be equivalent because it performs the same function in substantially the same way and

produces substantially the same result as the corresponding element in the applicant's

specification.

46.   With regards to the "second injection amount control means, which, when the

torque or rotation speed change amount determined by the first computation means is

not greater than a predetermined reference value, decreases the fuel injection amount

for the particular cylinder from the injection amount for stoichiometric operation" within

claim 1, this limitation meets the three prong test per MPEP 2181 and thereby invokes

35 USC 112 6th paragraph. The "second injection amount control means, which, when

the torque or rotation speed change amount determined by the first computation means

is not greater than a predetermined reference value, decreases the fuel injection

amount for the particular cylinder from the injection amount for stoichiometric operation"

is explained on Page 57, Lines 11-16 in the specification. Mashiki teaches a means,

which, when the torque or rotation speed change amount determined by the first

computation means is not greater than a predetermined reference value, decreases the

fuel injection amount for the particular cylinder from the injection amount for

stoichiometric operation (Column 10, Line 58 through Column 11, Line 17). The method

taught by Mashiki is considered to be equivalent because it performs the same function

in substantially the same way and produces substantially the same result as the

corresponding element in the applicant's specification.

47.   With regards to the "second computation means for determining the amount of a

torque or rotation speed change that occurs when the fuel injection amount for the

particular cylinder is changed by the second injection amount control means" within

claim 1, this limitation meets the three prong test per MPEP 2181 and thereby invokes

35 USC 112 6th paragraph. The "second computation means for determining the

amount of a torque or rotation speed change that occurs when the fuel injection amount

for the particular cylinder is changed by the second injection amount control means" is

explained on Page 57, Lines 16-18 in the specification. Mashiki teaches a means for determining the amount of a torque or rotation speed change that occurs when the fuel injection amount for the particular cylinder is changed by the second injection amount control means (Column 9, Lines 22-29). The method taught by Mashiki is considered to be equivalent because it performs the same function in substantially the same way and produces substantially the same result as the corresponding element in the applicant's specification.

48.   Therefore, it would have been obvious to one having ordinary skill in the art at the time the invention was made to have modified system disclosed by Shomura with the invention disclosed by Mashiki to arrive at the current invention.

49.   Furthermore, Shomura/Ishikawa et al. do not disclose the comparison and judgment means as set forth in the claim.

50.   However, Mashiki discloses

   a.   comparison means for comparing a predetermined reference value with the amount of a change that occurs when the injection amount control means changes the fuel injection amount from the injection amount for stoichiometric operation (Column 10, Lines 58-63);

   b.   and judgment means, which, when comparing the change to the reference value, judges that a permissible level is exceeded by the air intake amount variations among the cylinders (Column 10, Line 65 through Column 11, Line 17).

51.   The examiner notes that Mashiki compares the predetermined reference value

(dlnv − C1) to the amount of change that occurred (dln), and judges that a permissible

torque variation is exceeded as evidenced by the subsequent change in fuel injection

amount (Column 11, Lines 15-17). As has already been discussed, Ishikawa discloses

that it is common knowledge in the art that excess torque variation is linked to air intake

variation, thus in judging that excess torque variation has been exceeded, Mashiki

judges that a permissible level of intake air amount variation is exceeded.

52.   Therefore, it would have been obvious to one having ordinary skill in the art at

the time the invention was made to modify the system of Shomura/Ishikawa with the

system disclosed by Mashiki in order to make adjustments to the fuel injection amount

only when an excessive amount of air amount variation among cylinders occurs.

53.   **As to the newly added limitation of the intake air amount variation detector**

comprising: *Conversion means for converting the intake air amount variations*

among the cylinders to intake valve operating angle variations among the

cylinders and/or intake valve lift amount variations among the cylinders.

54.   **Sugiyama et al. disclose a control system with the claimed conversion**

means (Column 1, Lines 44-55)

55.   **Therefore it would have been obvious to one having ordinary skill in the art**

at the time the invention was made to modify the system disclosed by

Shomura/Ishikawa/Mashiki with the operating angle conversion means disclosed

by Sugiyama et al in order to accurately adjust the intake air amounts in each

cylinder of the engine.

56.   In Re claims 16-18, Shomura discloses

       a.   An injection amount control unit for changing a fuel injection amount from

an injection amount for stoichiometric operation to either an increased amount or

a decreased amount in a particular cylinder, or on an individual cylinder basis

(Column 5, Lines 24-26, and Column 7, Lines 17-30)

       b.   A computation unit for determining on an individual cylinder basis the

amount of a torque or rotation speed change that occurs when the fuel injection

amount is changed by the injection amount control means in a particular cylinder,

or on an individual cylinder basis (Column 8, Lines 10-14)

       c.   An output unit for outputting the torque or rotation speed change amount

determined by the computation unit as an index value that indicates the degree

of intake air amount variations among the cylinders (Column 14, Lines 38-67)

57.   Shomura does not disclose the comparison and judgment units as set forth in the

claim.

58.   However, Mashiki discloses

       a.   a comparison unit for comparing a predetermined reference value with the

amount of a change that occurs when the injection amount control means

changes the fuel injection amount from the injection amount for stoichiometric

operation (Column 10, Lines 58-63);

       b.   and a judgment unit, which, when comparing the change to the reference

value, judges that a permissible level is exceeded by the air intake amount

variations among the cylinders (Column 10, Line 65 through Column 11, Line 17).

59.   The examiner notes that Mashiki compares the predetermined reference value (dInv – C1) to the amount of change that occurred (dIn), and judges that a permissible torque variation is exceeded as evidenced by the subsequent change in fuel injection amount (Column 11, Lines 15-17). As has already been discussed, Ishikawa discloses that it is common knowledge in the art that excess torque variation is linked to air intake variation, thus in judging that excess torque variation has been exceeded, Mashiki judges that a permissible level of intake air amount variation is exceeded.

60.   Therefore, it would have been obvious to one having ordinary skill in the art at the time the invention was made to modify the system of Shomura/Ishikawa with the system disclosed by Mashiki in order to make adjustments to the fuel injection amount only when an excessive amount of air amount variation among cylinders occurs.

61.   **As to the newly added limitation of the intake air amount variation detector comprising:** *Conversion means for converting the intake air amount variations among the cylinders to intake valve operating angle variations among the cylinders and/or intake valve lift amount variations among the cylinders.*

62.   **Sugiyama et al. disclose a control system with the claimed conversion means (Column 1, Lines 44-55)**

63.   **Therefore it would have been obvious to one having ordinary skill in the art at the time the invention was made to modify the system disclosed by Shomura/Ishikawa/Mashiki with the operating angle conversion means disclosed**

by Sugiyama et al in order to accurately adjust the intake air amounts in each cylinder of the engine.

64.   In Re claim 19, Shomura discloses:

a.   first injection amount control unit for changing the fuel injection amount for a particular one of the cylinders from an injection amount for stoichiometric operation to an increased amount (Column 5, Lines 24-26, and Column 7, Lines 17-30)

b.   output unit for outputting the torque or rotation speed change amount determined by the first computation means and the torque or rotation speed change amount determined by the second computation means as index values that indicate the degree of intake air amount variation in the particular cylinder (Column 14, Lines 38-67)

65.   Shomura does not disclose:

a.   first computation unit for determining the amount of a torque or rotation speed change that occurs when the fuel injection amount for the particular cylinder is changed by the first injection amount control means

b.   second injection amount control unit, which, when the torque or rotation speed change amount determined by the first computation means is not greater than a predetermined reference value, decreases the fuel injection amount for the particular cylinder from the injection amount for stoichiometric operation

    c.   second computation unit for determining the amount of a torque or rotation speed change that occurs when the fuel injection amount for the particular cylinder is changed by the second injection amount control means (

66.   However, Mashiki discloses:

    a.   first computation unit for determining the amount of a torque or rotation speed change that occurs when the fuel injection amount for the particular cylinder is changed by the first injection amount control means (Column 8, Lines 60-65)

    b.   second injection amount control unit, which, when the torque or rotation speed change amount determined by the first computation means is not greater than a predetermined reference value, decreases the fuel injection amount for the particular cylinder from the injection amount for stoichiometric operation (Column 8, Lines 38-42)

    c.   second computation unit for determining the amount of a torque or rotation speed change that occurs when the fuel injection amount for the particular cylinder is changed by the second injection amount control means (Column 8, Lines 60-65)

    d.   a comparison unit for comparing a predetermined reference value with the amount of a change that occurs when the injection amount control means changes the fuel injection amount from the injection amount for stoichiometric operation (Column 10, Lines 58-63);

e.   a judgment unit, which, when comparing the change to the reference

value, judges that a permissible level is exceeded by the air intake amount

variations among the cylinders (Column 10, Line 65 through Column 11, Line

17).

67.   Therefore, it would have been obvious to one having ordinary skill in the art at

the time the invention was made to have modified system disclosed by Shomura with

the invention disclosed by Mashiki to arrive at the current invention.

68.   **As to the newly added limitation of the intake air amount variation detector**

comprising: *Conversion means for converting the intake air amount variations*

among the cylinders to intake valve operating angle variations among the

cylinders and/or intake valve lift amount variations among the cylinders.

69.   **Sugiyama et al. disclose a control system with the claimed conversion**

means (Column 1, Lines 44-55)

70.   **Therefore it would have been obvious to one having ordinary skill in the art**

at the time the invention was made to modify the system disclosed by

Shomura/Ishikawa/Mashiki with the operating angle conversion means disclosed

by Sugiyama et al in order to accurately adjust the intake air amounts in each

cylinder of the engine.

71.   Claims 4, 8, and 12 are rejected under 35 U.S.C. 103(a) as being unpatentable

over Shomura/Ishikawa et al./Mashiki/**Sugiyama et al.** as applied to claims 1, 5, and 9

above, and further in view of Maloney (US Patent 6,481,273 B2).

72.   In re Claims 4, 8, and 12, Shomura/Ishikawa et al./Mashiki/**Sugiyama et al.**

disclose the claimed invention except for the process wherein the computation means

extracts a change component having the same frequency as a fuel injection amount

change frequency etc.

73.   However, filtering process is common knowledge in the art, as is evidenced by

Maloney, who discloses the claimed response filtering process (Column 1, Line 45

through Column 2, Line 2).

74.   Therefore, it would have been obvious to one having ordinary skill in the art at

the time the invention was made the modify the system disclosed by Shomura/Ishikawa

et al./Mashiki/**Sugiyama et al.** with the filtering process disclosed by Maloney in order

to get a more accurate assessment of change in torque as a result of a single fuel

injection.

75.   Claim 14 is rejected under 35 U.S.C. 103(a) as being unpatentable over

Shomura/Ishikawa et al./Mashiki/**/Sugiyama et al./**Maloney as applied to claims 1 and 4

above, and further in view of Yomogida (US Patent 6,513,496 B2).

76.   In re Claim 14 Shomura/Ishikawa et al./Mashiki/**/Sugiyama et al./**Maloney do not

explicitly disclose a periodic change of injection outside of the range of human

perception.

77.   However, Yomogida discloses a system wherein an injection amount control

means periodically changes the fuel injection amount at a frequency outside the range

of human perception (see abstract)

78.   Therefore it would have been obvious to one having ordinary skill in the art at the time the invention was made to modify the system disclosed by Shomura/Ishikawa et al./Mashiki/**Sugiyama et al.**/Maloney with the injection amount control means disclosed by Yomogida in order to provide a system that is less disturbing to the occupants of the vehicle.

Response to Arguments

79.   Applicant's arguments with respect to claim 15, as discussed in the interview held on 11/20/2008 have been considered but are moot in view of the new ground(s) of rejection.

80.   In response to the addition of the limitations of Claim 15 ("Conversion means for converting the intake air amount variations among the cylinders to intake valve operating angle variations among the cylinders and/or intake valve lift amount variations among the cylinders"), being added to claims 1, 5, 9, 13, 16, 17, 18, and 19, the examiner asserts that Sugiyama et al. disclose the claimed conversion means.

Conclusion

81.   **THIS ACTION IS MADE FINAL.** Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire THREE

MONTHS from the mailing date of this action. In the event a first reply is filed within

TWO MONTHS of the mailing date of this final action and the advisory action is not

mailed until after the end of the THREE-MONTH shortened statutory period, then the

shortened statutory period will expire on the date the advisory action is mailed, and any

extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of

the advisory action. In no event, however, will the statutory period for reply expire later

than SIX MONTHS from the mailing date of this final action.

Any inquiry concerning this communication or earlier communications from the

examiner should be directed to SIZO B. VILAKAZI whose telephone number is

(571)270-3926. The examiner can normally be reached on M-F: 10:00am-5:00pm.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's

supervisor, Stephen K. Cronin can be reached on (571) 272-4536. The fax phone

number for the organization where this application or proceeding is assigned is 571-

273-8300.

Information regarding the status of an application may be obtained from the

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USPTO Customer Service Representative or access to the automated information

system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

/SIZO B VILAKAZI/
Examiner, Art Unit 3747

/Stephen K. Cronin/
Supervisory Patent Examiner, Art Unit 3747